A CAHNERS PUBLICATION

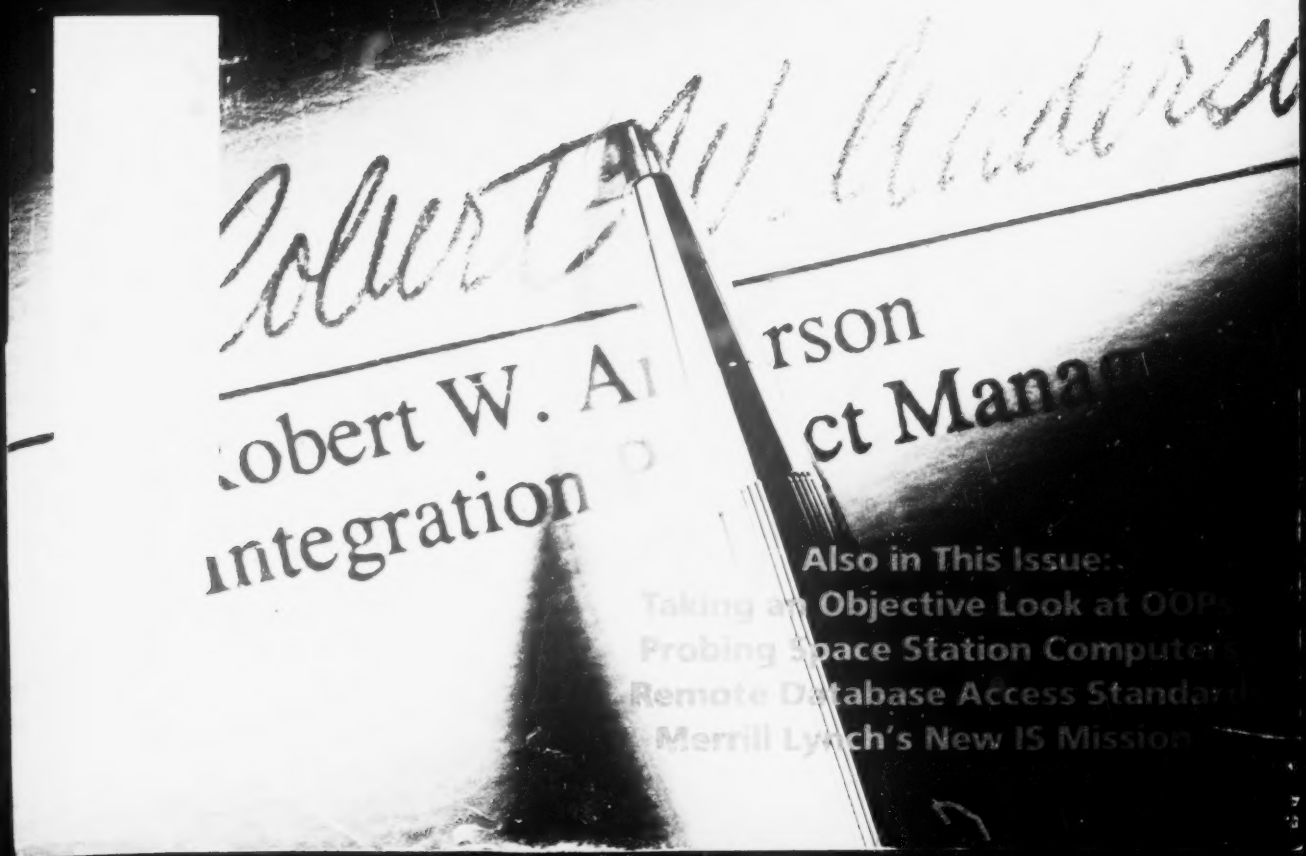
TECHNOLOGY FORUM II: Open Systems

DATAMATION

FOR MANAGERS OF INFORMATION TECHNOLOGY WORLDWIDE

Contracting With Integrators

Before You Sign, Make Sure the I's Are Dotted And the t's Are Crossed



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Objective Look at OOP

ace Station Computer

Remote Database Access Standard

ch's New IS Mission

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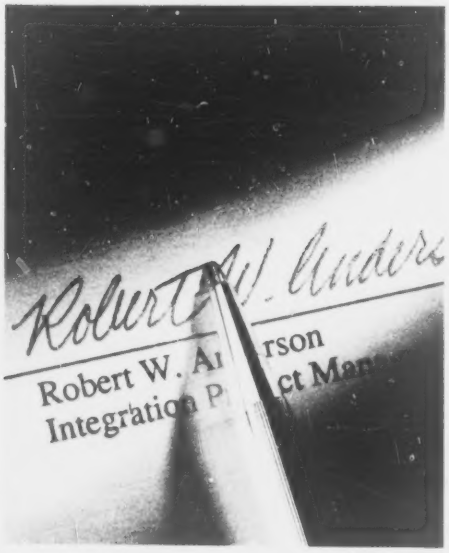

Contracting With Integrators 18

BY JEFF MOAD IS organizations in commercial companies are increasingly relying on outside systems integrators for development projects. But many users are still unskilled in dealing with these outside firms and in devising both requirements and contractual agreements. Much is at stake, though, and some disputes have resulted in awards for damages totaling millions of dollars. Users can protect themselves if they follow a few practical steps.

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Cover Photography by Curt Berner

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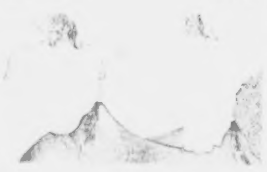

OPEN SYSTEMS
Technology Forum 25

"For many IS users today, open systems promise to nudge open the door to new opportunities by providing easier and more economical ways of flexibly fashioning technology to accommodate changing business needs." This second Technology Forum takes a hard look at the phenomenon of open systems, its prospects and problems.

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EDITED BY LINDA RUNYAN A report on products, services and methodologies for IS managers in manufacturing businesses. Future editions will serve managers in the financial services and government sectors. (Not included in all issues.)

Dealing From a Position of Strength

For many information-processing professionals, the activity known as systems integration is not new: various forms of integration have been practiced for decades, from simply putting together a system in house to implementing big government projects handled by companies specializing in this work. But what is different—maybe even new—today is the extent to which systems integration is being practiced in the commercial world. IS managers in every type and stripe of commercial business are concerned with getting their corporate computing resources moving in the same direction. Standards, cost effectiveness and commonality are uppermost in their minds.

Between desire and fulfillment, there is still a considerable distance to be traveled. And, as senior writer Jeff Moad explains in this issue's cover story, "Contracting With Integrators," IS managers are finding out just how long a trip it is, as well as how many obstacles lie along the road. For a variety of reasons—such as shrinking internal development resources due to cost cutting and decentralization—IS managers in the private sector are looking to outside integrators for help. For many, dealing with outside integrators is a new experience and one that can produce mixed results.

Photograph by Marti Bavoni

JAMES RIVER's PIASCIK is an example of an IS chief dealing well with systems integrators

"Many are feeling their way along, getting on-the-job experience and, in some cases, learning from their mistakes," Moad writes. "Often . . . the mistakes are few, and the results are positive. Sometimes the mistakes can lead to disastrous results for user and integrator alike."

The message is that you, the consumer of systems integration services, must take an active and constant role in managing both integration projects and the companies providing services. Know your requirements, hammer out a contract that specifies what's to be done— and when—and understand the relationships among parties involved in the project.

To deal effectively with outside integrators, users need to be in a position of strength. Our article in this issue can provide some solid recommendations for how to develop the necessary muscle.

While Merrill Lynch's information system may not have been broke, it certainly was in need of some improvements, as former DATAMATION editor John Kirkley writes in "No Magic, Just Hard Work," page 67. Merrill Lynch's corporate MIS division, which handles the company's core financial software systems, created some new and very creative job titles and system operation guidelines to achieve an overhaul of its systems. The result, as Kirkley points out, has been faster report generation, faster application development and a more decentralized operation.

Technology Forum: Open Systems

Our second Technology Forum, this one on Open Systems, appears in this issue beginning on page 25. Senior editor Linda Runyan has put together a package of stories on this very current, and controversial, subject that will put into perspective what open systems mean for IS users. Just how is open systems defined? What are the consequences of open systems for your organization? How do you migrate from a proprietary system to an open system? Many questions. Many possible answers. Much debate in the Forum. We urge you to join in.

David R. Brousell, Executive Editor

DATAMATION

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Taking an Objective Look

Vendors and early adopters are purposely taking their time exploiting and exploring object technology. They want to be sure it delivers on the promise of improving application development.

BY DAVID STAMPS

Two years ago, object-oriented languages and programming environments were being billed as the next great IS productivity tools. Using such technology, vendors promised, would increase programming productivity not by a mere 10 to 15%, but 10- to 15-fold.

Object programming—which lets software developers and users write programs by assembling modular blocks of routines and procedures rather than stringing out thousands of lines of linear code—was also lauded for other potential benefits. Chief among them was the ability of programmers to design large, complex, highly interactive systems that are nearly impossible to build and maintain using today's structured techniques.

Not all of those bold predictions have been fulfilled. "There's a whole set of fundamental requirements that are lacking: tools, access languages, fourth-generation languages, data backup and recovery," says Jonathan Eunice, a manager for Tarrytown, N.Y.-based market researcher D.H. Brown, in explaining why object technology hasn't reached the takeoff stage. "Today's object database vendors are small start-ups with just barely enough resources to build their basic product and put together some semblance of sales organization," he says, referring to such companies as the not-ready-for-prime-time players.

Yet enthusiasm for object-oriented software has never been higher. Some experts even go so far as to use the word *passion* when describing the technology (see "The Object of Desire," May 1, 1988, p. 37). The concept has enormous appeal because object languages and tools hold the potential to enhance the performance of professional programmers and to let nontechnical people create some of their own programs. That would solve a problem that other hoped-for solutions—fourth-generation languages and information centers—have failed to alleviate: the chronic backlog of applications.

Major systems vendors are beginning to include mention of object features in their products. Conferences on the subject are springing up. Companies are even starting to invest modestly in the technology, though several interviewed by DATAMATION caution that they're merely experimenting with it.

"We're looking at it with some interest. But a lot of things have to happen before it becomes the sort of software you would bet your business on," says David Irvon, systems analyst and methodologist for Pacific Bell in San Ramon, Calif., citing reliable systems development methodologies and robust relationships to databases as two areas of needed improvement.

"We're strictly in the evaluation mode," says Michael Viste, senior development engineer in Allen-Bradley Co.'s advanced technology group in Milwaukee, which has been experimenting for a year with two object products, a language called SmallTalk and an object-oriented database called Gemstone. "There's no goal to move whole hog into an object-oriented programming environment."

Mindful of the slow acceptance of any potentially critical technology, object vendors are going out of their way to underplay their products to avoid disappointing users. "The word *object* has been hyped a lot in the past couple of years," says Michael Connell, general manager at Servio Logic Corp. in Beaverton, Ore., the developer of Gemstone. "It's almost like the frenzy surrounding AI [artificial intelligence] a few years back. Anything with an icon is said to be object-oriented."

Innovative Systems Techniques Inc. (INSYTE) of Newton, Mass., has sold a financial analysis system called Vision to about seven investment banks and brokerage houses in the past two years. Key to the system is an object database and proprietary object-oriented programming language that lets users pull financial information from a variety of commercial databases to perform specialized yield analysis.

"When we first started selling Vision, we never mentioned object technology,"

Object-Oriented Vendors

Just a few companies singularly focus on the market

Company	Products	Description	Circle
Graphael	Gbase	Database manager	100
Innovative Systems Techniques	Vision	Financial software	101
Ontologic	Vbase	Database	102
Servio Logic	Gemstone	Database	103

Source: Company reports, DATAMATION

says Richard Newman, INSYTE's marketing director. "When *object-oriented* got to be a buzzword, we started to talk about it a little bit, but I'm not sure talking about it has been a help or a hindrance. Our market tends to be conservative. The idea that we're selling something futuristic could scare our customers away—especially if we were to be lumped in with the AI set."

Big Payoffs in the 1990s?

The conservatism stems from the realization that up to five years may pass before object technology starts to deliver its promised benefits in a big way. Factored into the incubation period, reminiscent of the one that the relational database market experienced before bursting on the IS scene, are management and professional issues, as well as the expected technical hurdles. The considerable difference between structured and object programming means that the latter will face a steep learning curve.

"A move to object-oriented programming can mean a major sell to the entire company," says Norman Kerth, a consultant in Portland, Ore. "In many cases the people who best understand the need for object-programming are technical workers who may not be in a position to persuade upper management." Those technical workers also may resist using somebody else's software blocks (objects) to build an application, particularly if such materials lack proper documentation. Once a user organization does build a library of objects, the question arises: Who controls the library—central IS or individual product groups?

The proper use of object technology requires a substantial customer investment in training. Unless programmers are willing to go through a three- to six-month education process designed to change the way they think about systems design, they probably won't be able to do true object programming.

Heightened Vendor Activity

The object paradigm is, to be sure, a radical departure from past and present programming frameworks. Born in the early 1970s at Xerox Corp.'s Palo Alto Research Center (PARC), the idea was to develop a language (SmallTalk) that bypassed the abstract thinking of conventional programming. Doing so, Xerox researchers thought, would allow children to create programs by stringing together blocks of prewritten software. Like many things to come out of PARC, the idea was ahead of its time.

Hoping to be for once the one to cash in on PARC's innovation, Xerox last year created a subsidiary, ParcPlace Systems, to market SmallTalk. Xerox has also licensed SmallTalk to an assortment of vendors: Apple, Hewlett-Packard Co., Sun Microsystems Inc. and Tektronix Inc. These companies' interest signals the enormous commercial potential for object-oriented products, which is attracting both start-ups and billion-dollar vendors to the field.

AT&T's object programming language C++ is gradually moving from research labs into the hands of object software vendors and advanced technology groups within corporations. HP recently introduced New Wave, an object-oriented programming environment that will enable programmers to link software objects together. Microsoft is working on an object programming environment. Elements of object-oriented technology are showing up in new computer hardware, most notably IBM's AS/400 and the NeXT Inc. workstation. In addition to object-programming languages, a proliferation of companies are developing and selling early versions of object-oriented databases (see sidebar, "A Partner, not a Predator").

Some Inherent Advantages

Vendor activity notwithstanding, object technology remains difficult for most programmers to grasp because it rejects the idea that code and data should be separate. Instead, it binds them together in modules or objects. Each object, in fact, encapsulates both data and a set of instructions that describes behavior and attributes of the object. Objects may vary in size from a small routine to an entire application. Messages passed among objects determine how one object interacts with another.

Encapsulation offers a few advantages

A Partner, not a Predator

So you've just wrapped up a costly multiyear, multimillion-dollar project to convert your old IMS database to DB2 and you're feeling pretty smug. Well, brace yourself for the next step in database evolution: object-oriented databases.

Relational databases mark a dramatic improvement over simple file systems with no inherent structure. Using query languages, users can sort through volumes of data arranged in a logical hierarchy. But the logical relationships of the relational model don't always match real-world relationships, particularly applications that have a large number of complex data types, such as computer modeling or computer-aided design and manufacturing.

Enter object databases, in which the data structure is determined by the relationships among objects.

Computer-aided design and manufacturing, with its baffling complexity of screws, bolts, parts and subassemblies, appears to be an ideal target for object-oriented databases. Dataquest Inc. estimates 10% of CAD/CAM vendors today employ some form of object-oriented database. By 1995, most CAD/CAM applications will be written on top of object databases.

One high-tech firm that is starting to kick the tires on the new technology is Boeing Aerospace Corp. in Seattle. Like many large manufacturers, Boeing faces the problem of having to navigate its way through a plethora of hardware and software platforms: IMS databases, graphics databases, COBOL and FORTRAN applications. The company is investigating a project to link its Oracle relational database system with Gbase, an object database from Waltham, Mass.-based Graphael Inc.

"The advantage of an object database is that it can look at nonstandard data sets, such as graphics and large binary files," explains Patricia Davis, software engineer at Boeing. "Object database[s] can also look at other databases and treat them as objects."

This kind of cross-systems role is one area where object databases could prove useful for IS shops now attempting to distribute databases across the corporation. "Once you distribute the data, it's naive to assume one database technology can serve all end users," says object analyst Jeff McKenna.

Boeing's use of Gbase and Oracle together may also be indicative of the niche role object databases will play: object databases won't supplant relational technology, they will augment it. "In most customer sites, we tend to be a little piece of the solution, but an essential piece, in that it's Gbase that gets you in and out of other databases," says Joe Hancock, president of Graphael.

over traditional programming:

- Complex relationships between data elements difficult to capture in the abstract can often be more accurately modeled by the structure of objects and the messages that determine how the objects interact with one another.

"Objects let users model their own world," says Esther Dyson, editor of "Release 1.0," an industry newsletter.

- Interdependence among objects is strictly limited by the messages that they can send and receive. A change within one object will not affect the behavior of another object. That means maintenance of an object system will not be nearly the headache it can be with existing large systems.
- Larger systems using interrelated but independent objects can be built.

The Airline Marketing Tactician, a program designed to let airlines balance no-shows and overbooked seats on a flight-by-flight basis, is a good example of an application that fits well into the object framework, but which would have been difficult, if not impossible, to write in linear code. Written in Small Talk, the program estimates demand for the half a dozen or more fare classes that carriers typically offer, from full-fare to deep-discount.

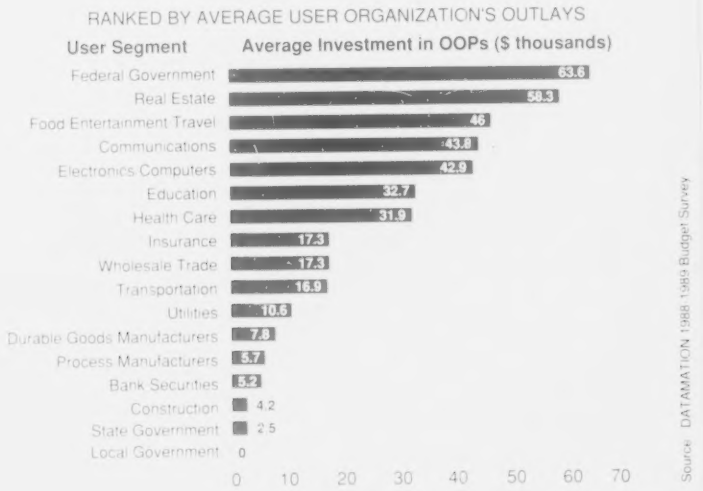
"It might have been possible to write this application using conventional programming, but it would have taken a multimillion-dollar budget and 20 people," says Ken Stevens, chairman of BehavHeuristic, developer of the Airline Marketing Tactician. Using Small Talk enabled the College Park, Md., company to develop a prototype in three years with just two people.

Another key feature of the object approach is a quality known as "inheritance," which allows the attributes and behaviors of one object to be incorporated into another object. Objects can be structured in class hierarchies: plant, angiosperm, tree, chestnut and so on. To add a new subclass (American chestnut), the programmer need not start from scratch, rather he needs only to specify the attributes that differentiate the new object from the other objects in the class hierarchy.

The benefits of inheritance can be seen in a graphics application, where the instructions to display or manipulate a shape can be inherited by other subclass objects. Bart Shutte, manager of object-based development with Andersen Consulting in Chicago, found inheritance to be a boon when he used Small Talk to help a client build four graphics application packages. "It took two of us four months to build the first one," Shutte says. "The other three we built in one month each."

Who's Developing Object-Oriented Applications?

U.S. agencies and commercial real estate firms are most aggressively pursuing OOPs solutions in 1989.



Software Libraries of the Future

Just as inheritance speeds the development of applications, there are even greater advantages that may result from object software's reusability. Vast libraries of object routines and procedures, even object applications, could one day become available. Once that happens, off-the-shelf commodity objects could be assembled to form applications the way off-the-shelf integrated circuits have speeded up and reduced the cost of computer hardware.

The development of reusable object libraries is moving slowly, but it's starting to happen. Applied Intelligent Systems Inc. (AISI) is an Ann Arbor, Mich., company that builds machine vision systems used for assembly and inspection in the automotive and electronics industries. The company is using Stepstone's Objective C product to convert into objects its library of about 450 functions (some of which need to be packaged into higher level software with each system it sells). The conversion, once completed, will enable AISI to build semicustom systems much more efficiently.

The project is moving along well but slowly. It's also not yielding astronomical productivity increases. One of the problems is the steep learning curve for using an object-oriented language. Since C programmers must learn to forget old ways of doing things, it takes about the same time to retrain an existing programmer as it does to break in a new programmer—three to six months. "We're seeing more like a two- to three-fold improvement," says Dave Coupland, AISI's manager of software engineering.

Improvement in the price/performance of computer systems has removed one minor technical obstacle to object-oriented programming—the fact that it consumes about 10% more computing power. Today's workstations, in fact, can easily run most object applications. Moreover, hybrid languages like Objective C and C++ offer better performance by grafting object capabilities onto conventional languages. "There's adequate computer power available," says Jeff McKenna, a consultant in Taulitin, Ore.

The bigger issue, say McKenna and others, is how much power IS executives and their superiors can exert in influencing their staffs to objectively assess object technology. The management team's awareness of how programmer efficiency affects organizational profitability can only help the cause of object technology.

David Stamps is a freelance writer in Minneapolis, Minn.

MANUFACTURING SECTORS

SCAN

AI Keeps Rohm and Haas Trucking

ROHM AND HAAS IS FINDING THAT EVEN SIMPLE TASKS BENEFIT FROM EXPERT ADVICE. THE CHEMICAL GIANT IS USING ARTIFICIAL INTELLIGENCE TO DETERMINE THE BEST WAY TO LOAD ITS TRUCKS WITH ITS SOMETIMES VOLATILE CARGO.

When it comes to figuring out the best way to load a 48-foot tractor-trailer with drums and pallets containing its product, Rohm and Haas Co. has a great idea: use AI. The $2.5 billion Philadelphia-based chemical concern has just produced an expert system that determines the ideal way to load and brace its sometimes hazardous cargo so that the truck doesn't blow sky-high when the driver stops short.

The expert system was completed in March 1988 and is now being tested by end users—shipping supervisors at several Rohm and Haas plants. From input such as the type and size of the truck, the content and number of drums, the number of pallets and the sequence in which the material is to be unloaded, the expert system generates a series of printed diagrams showing loading personnel where to place and how to stack the material on the trucks and where to insert bracing boards to prevent the load from shifting in transit.

Rohm and Haas is trucking more through AI.

According to Marina Dussan, a knowledge engineer with Rohm and Haas' Expert Systems Group, the system calculates the most efficient way to load the product on the truck, determining whether the load will fit and not exceed weight limits. The system knows which compounds react with one another to prevent loaders from stacking deadly combinations. "It basically does the whole job," says Dussan.

The application uses Texas Instruments Inc.'s Personal Consultant Plus expert system shell and was developed using mostly internal AI personnel. Rohm and Haas has deployed six systems in three plants, running on a combination of 286-based machines from IBM and Televideo Systems Inc. So far, says Dussan, the systems are performing well. However, "they're a little bit slow, and we're trying to find out how to speed them up a bit." Over the next two years, Dussan expects these bugs to be ironed out. By then, the system should be operating at each of Rohm and Haas' remaining four plants. ◀

Sara Lee's New Recipe for Success

Sara Lee Corp. knows it takes more than scrumptious products and a well-loved name to ensure success in the rough-and-tumble baked goods business. It takes flexibility, as well, so the $8 billion Chicago-based food and consumer products company is now building a plant that will react quickly to changes in demand for its over 1,000 bakery items.

The Tarboro, N.C., plant, which is less than six months from starting operation, will be able to produce four times the number of different products in one day than can be made in the company's other plants. The new plant's production schedule can be revamped each day, shifting production to whatever the market seems to be buying at the time.

Rather than being process-driven, the Tarboro plant will depend on an information-based system, says Gerry Doherty, vice president of engineering in Sara Lee's bakery division. The plant consists of a number of "cells" that perform specialized functions, such as mixing batter, depositing the batter in pans, baking, frosting and packaging. Depending on how a product is routed through the various cells, it can become a chocolate cake or a croissant, a bran muffin or a bagel.

Production is controlled by a Digital 6210 minicomputer linked via Ethernet to a raft of cell controllers consisting of a 386-based PC located at each cell. At the start of a day, the minicomputer sends part of its daily schedule to the cell controllers, telling them such things as baking times, oven temperatures and the route of a product through the labyrinth of cells. Holding the instructions necessary for four hours of production, the cell controllers run the manufacturing process, loading products in, and routing them from, storage buffers between the cells.

Baked by a DEC mini

The Tarboro plant, developed with the help of outside systems integrators, will use bar codes for inventory control and for tracking materials and personnel through the manufacturing process. ◀

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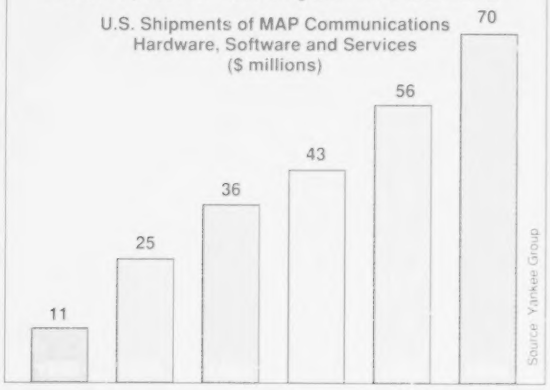
Editor: Linda Runyan
Scan Writer: Michael R. Leibowitz

MAP MOVES INTO THE MARKETPLACE

With the advent of version 3.0, Manufacturing Automation Protocol is poised for moderate growth in the U.S. market.



PCs in Lab Keep Nike out In Front

The heart of a running shoe is its midsole, and, thanks to two IBM PC ATs in its Sports Research Lab, Nike Inc. is starting to collect information that will allow its designers to produce midsoles to protect the foot from injury while allowing wearers to run faster and jump higher.

The Beaverton, Ore.-based shoe manufacturer uses the PC ATs to model the pressure distribution across various types of midsoles, ranging from ethylene vinyl acetate foams to the company's patented air-cushioning system. The modeling, says Martin Shorten, director of the lab, gives designers a close look at how these materials respond when people walk or run at different speeds.

Nike's PC AT gets at the sole of a new running shoe.

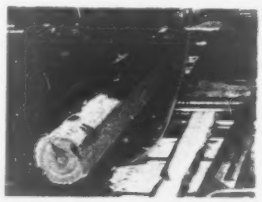
Nike's midsole modeling system works like this: a runner jogs down a 150-foot runway in the lab, stepping on a 9×12-inch plate containing a matrix of 2,000 pressure sensors. A PC AT scans the plate 100 times a second and stores the pressure information on a hard disk. Following the test, the data are fed to another PC AT, along with the dimensions of the midsole and its viscoelastic characteristics. The second machine generates a series of plots showing such things as how much and how rapidly the midsole depresses during impact, how much strain energy is absorbed and how much heat is dissipated.

The result is a series of animations showing the two-dimensional surface of the midsole, along with a profile of just about every characteristic a designer could care about, according to Shorten. The system has been operating for a little over a year, Shorten adds, and is finally starting to change the way Nike develops midsoles. ◀

Potlatch Logs On to Automation

How do you saw up a giant log into individual pieces of lumber? There may be an infinite number of ways, but computers at Potlatch Corp.'s newly renovated saw mill in Lewiston, Idaho, select the exact one that yields maximum value from each fallen tree. The mill, which has been operating since January 1988, uses four of Digital's Micro PDP 11/73 computers to control a series of saws that slice and dice huge 55-foot logs cut down from forests in the great Northwest.

Each log is scanned by a matrix of light beams that provides profiles to the computer, which combines this information with the species of the log in question and the current wholesale price of lumber to figure out how many 2×4s, 1×6s, 1×8s and other lengths to cut from the log. Based on the results of the 11/73's optimization program, the saw is instructed where to place the cuts.



AI helps Potlatch carve out greater profits.

After passing under four saws, each controlled by its own 11/73 and having its own scanners, the log is completely cut up into pieces. Before each cut, the log is rescanned, and a new optimization is performed on the dimensions of the remaining piece.

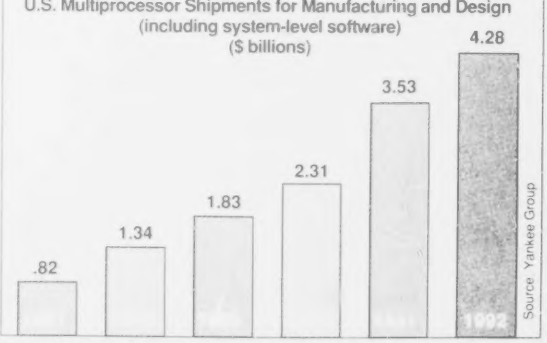
The four 11/73s are connected via RS-232 links to an IBM PC AT, which gathers data on the number and type of products hewed from the log, the percentage of wood recovered and the value of the finished product. Each 11/73 is updated monthly with new optimization data if lumber prices change.

The Lewiston mill is not the first of its kind in the lumber industry, but it is a first for the conservative, $1.1 billion lumber, pulp and paper company. Prior to this, mill operators would eyeball the log and use lasers to trace outlines of the proposed cuts. With the new automation, provided by Canadian systems integrator Kockums Cancar Inc. of Surrey, British Columbia, some of the saws run five times faster than they did previously, says Mike Fish, modernization project engineer.

Wrinkles have yet to be ironed out of the system, says Fish, but this is expected to occur by midyear. Still, declares Fish, "anybody who's in the lumber business today has to have this kind of equipment to get the recovery and speeds needed to be competitive." ◀

NEW COMPUTER ARCHITECTURES

Manufacturers are adopting multiprocessor computers for more and more tasks in the factory and design lab.



Unisys Shrinks Chip Development Time

Designing chips quickly is one key to success for makers of electronic equipment, and a new software tool developed by Blue Bell, Pa.-based Unisys Corp. allows its chip designers to slash the amount of time it once took to turn out a design. Using proprietary software, Unisys designers can now design chips at the so-called behavioral level, a more abstract and less detailed design level than the logic level, which is where most chip design is done today.

Instead of developing time-consuming logic diagrams and entering those into the CAD system, Unisys designers generate chips by writing lines of code that describe the exact behavior of the intended circuitry. The software, which Unisys calls its Modular Development System (MDS), then takes over, turning out the circuitry schematic—and, with other CAD tools, the actual layout—for the eventual chip.

With MDS, says Herman Brown, senior physicist at Unisys, "We are not tied down to drawing all the nitty gritty logic that we have to do at the schematic level." The resulting time savings are impressive: Brown reports a 60 to 70% reduction in chip development time using MDS versus schematic-level design.

Approximately 70 Unisys

New software helps Unisys speed chip development.

chip designers currently use LISP-written MDS to turn out chips containing hundreds of thousands of transistors for a range of machines. The tool, for example, was instrumental in allowing Unisys to condense 533 circuit boards into a single board for its Micro A desktop computer. The MDS tool runs on Apollo Computer Inc. workstations and 386-based PCs and works in concert with other chip CAD tools, both purchased and internally developed. ◀

Ford Crashes Cars on a Convex

Designing new bumpers used to be a painfully slow process, taking two to three months to build each prototype, attach it to a car and crash test it. But now, designers at Ford Motor Co. are banging out bumper designs with the help of a minisupercomputer from Convex Computer Corp. of Richardson, Texas.

A Convex minisuper lets Ford put its bumpers through their paces before you do.

A new system using finite element analysis allows the Dearborn, Mich.-based car maker to perform multiple impact five-mile-per-hour crash tests against barriers and other cars with the press of a return key. The system also enables the engineering department to test various ideas for bumper designs.

The system taps the power of the Convex C210 minisupercomputer, running around the clock, to turn out a new design and a series of crash tests in less than a week. Designs are first modeled on either a Digital MicroVAX II hooked to a Tektronix color graphics terminal or on Ford's Prime-based CAD system. Then, an engineer selects such options as type of crash, speed and weight of the car and starts the simulation.

The computational analysis of a 100 millisecond crash runs for 16 to 24 hours on the dedicated Convex, according to Gregory Kaepp, a technical specialist at Ford.

The result of the overnight simulation is a color image of a crashed bumper, showing high-stress areas in red. Kaepp can collect a sequence of images and create an animation of the crash, or, following the first simulation, he can "crash" the car repeatedly to see how the bumper stands up.

Rotating the bumper on the screen in its deformed state, designers can find out where to add bumper material to strengthen the design and where to remove material to lower cost and weight. Following a volley of simulations, a model is developed and crash tested on a real car, to verify results. ◀

Ordering up Performance at GAF

Two years ago, Wayne, N.J.-based GAF Corp. was not exactly known for its ability to ship product to customers on schedule. "A customer," says MIS manager Dick Refsler, "would place 20 orders with you, and maybe two or three would ever get shipped." Luckily, that's changing now with the new GAFMASTER order entry and scheduling system that the $1 billion building products company is installing.

GAFMASTER, which GAF spent the last 18 months developing and testing, runs on a series of IBM 5364s located in each of its U.S. manufacturing sites. The 5364s handle order entry, production scheduling and shipping paperwork for each factory individually, driving 13 workstations per site.

But the real distinction of GAF's new system is the fact that it improves the plants' ability to plan production. Orders are allocated based on a production plan, and customers can be told, with reasonable reliability, when their orders will be shipped.

In fact, the system has already been providing 85 to 95% accuracy on shipment dates, a marked improvement. "It's been working out very well," says Refsler. "The decision was made that we had to service our customers. We're saying: 'We'll be able to give you that product, and here's the date.' "

All this is a far cry from the old order-entry system, says Refsler, which was a batch operation that did not provide the access to ordering and production data that the new system does.

In fact, GAFMASTER provides the foundation for a computer-integrated manufacturing effort that GAF will execute over the next five years, involving automation of the production lines.

As of April, GAFMASTER was running at seven of GAF's 11 sites and, by June, GAF expects it to be running at two or three more. At the end of the day, each system calls up the corporate IBM mainframe, updating accounts receivable and other records.

Many of GAF's competitors are centralized. In contrast, GAF's decentralization in computing is in accord with its decentralized manufacturing strategy. "We feel we can do much better by letting the local site handle itself," Refsler concludes. ◀